

## **ABSTRACT OF THE DISCLOSURE**

The invention presents a method of radiation dosimetry and radiation field imaging. It utilizes luminescent material based on aluminum oxide doped with carbon and magnesium ( $\text{Al}_2\text{O}_3\text{:C,Mg}$ ) and containing aggregate oxygen vacancy defects. Storage of dosimetric information is based on ionization of the crystal matrix, generation of free electrons and capture of electrons and holes by traps and color centers. An absorbed dose is determined by non-destructive readout of fluorescence from color centers induced by radiation. The preferred mode of measurements is to illuminate the  $\text{Al}_2\text{O}_3\text{:C,Mg}$  phosphor with a red laser (at 635 or 650 nm) and to measure the intensity of 750 nm fluorescence. Method allows for high temperature and environmental stability of dose information. The detector material is insensitive to room light before and after the irradiation and provides a fast data rate during scanning for imaging of radiation fields.